

MaCS 2010
8-th JOINT CONFERENCE ON
MATHEMATICS
AND
COMPUTER SCIENCE

Komárno, Slovakia, July 14–17, 2010

SELECTED PAPERS

EDITORS:

Horia F. Pop and Antal Bege

Novadat Bt.
Győr, Hungary
July, 2011

Patron's Preface

The Joint Conference on Mathematics and Computer Science is an international meeting of scientists in the fields of mathematics and computer science. This conference was first initiated by Eötvös Loránd University in Budapest and Babeş-Bolyai University in Cluj-Napoca in 1994. The topics of the conference include all branches of mathematics, computer science and their applications. It is open to the interests of the potential participants from universities and research institutions.

With an increasing number of participants, several other universities joined this cooperation. The first seven Conferences took place in Ilieni, Romania in 1995 and 1997, Visegrád, Hungary in 1999, then in Băile Felix, Romania in 2001, in Debrecen, Hungary in 2004, in Pécs, Hungary in 2006 and in Cluj-Napoca, Romania in 2008. The organizer of the 8-th Joint Conference on Mathematics and Computer Science in 2010 was J. Selye University in Komárno, Slovakia. 85 participants from more than 8 countries registered to the Conference, which hopefully contributed to deepening the old friendships and initiated new ones as well as lead to an intensive exchange of scientific ideas.

I would like to thank for the opportunity to be a part of the Organising Committee of this Conference. Our university was graced with this honour.

In this preface I would like to thank the Co-Chairs of the 8th Conference on Mathematics and Computer Science, Professors:

- Petru Mocanu, from Babeş-Bolyai University in Cluj Napoca and
- Zoltán Sebestyén from Eötvös Loránd University in Budapest.

I am pleased to thank the Steering Committee of the Joint Conference on Mathematics and Computer Science :

- Antal Bege, Sapientia University, Târgu-Mureş,
- Zoltán Csörnyei, Eötvös Loránd University, Budapest,
- István Faragó, Eötvös Loránd University, Budapest,
- Zsolt Páles, University of Debrecen,
- Horia F. Pop, Babeş-Bolyai University, ClujNapoca,
- Anna Soós, Babeş-Bolyai University, ClujNapoca,
- László Tóth, University of Pécs.

I also thank the organizers of the event:

- the Faculty of Mathematics and Computer Science of the Babeş-Bolyai University in Cluj-Napoca,
- the Faculty of Informatics and the Institute of Mathematics of the Eötvös Loránd University in Budapest,
- the Department of Mathematics and Informatics of the Sapientia - Hungarian University of Transylvania,
- the Faculty of Informatics and the Institute of Mathematics of the University of Debrecen,
- the Institute of Mathematics and Informatics of the University of Pécs,
- the Bolyai Institute (Institute of Mathematics) and the Kalmár László Institute (Institute of Informatics) of the University of Szeged,
- the Department of Mathematics and the Department of Computer Science of the J. Selye University in Komárno.

This volume includes selected and refereed papers of MaCS 2010, based on invited and contributed presentations of the conference.

doc. RNDr János Tóth, PhD.

The Patron of the 8th Conference on Mathematics and Computer Science

Editors' Preface

The Joint Conference of Mathematics and Computer Science (MaCS) was started in 1994 as a series of biennial conferences by the Eötvös Loránd University in Budapest, and the Babeş-Bolyai University in Cluj. The purpose of the conference has been to become a forum of intellectual communication and cooperation covering all branches of Mathematics, Computer Science, and their applications, open to the interests of all potential participants, from scientific academy to graduate students and industry.

The Komárno edition of MaCS is the eighth, following the successful development of the previous editions in Ilieni/Ilyefalva, Romania (1995 and 1997), Visegrád, Hungary (1999), Băile Felix/Félixfürdő, Romania (2001), Debrecen, Hungary (2004), Pécs, Hungary (2006), Cluj/Kolozsvár, Romania (2008).

Following the original effort of the universities ELTE in Budapest and BBU in Cluj, the series of MaCS conferences is now organized by an informal consortium of eight universities, namely the Babeş-Bolyai University in Cluj, the Eötvös Loránd University in Budapest, the Sapientia - Hungarian University of Transylvania, the University of Debrecen, the University of Pécs, the University of Szeged, and the János Selye University in Komárno.

This significant extension confirms without any doubt that the idea of the original creators was just. What was 16 years ago a singular effort of two partner universities is becoming a Central European conference contributing to a better understanding of Mathematics and Computer Science. This would not have been possible without the consistent efforts of all the people taking care of all the previous editions, to whom we are all indebted.

The Program Committee invited keynote lecturers from Péter P. Pálffy (ELTE), Florian Mircea Boian (BBU) and Ladislav Mišik (Ostrava) and János Tóth (JSU). Their contributions were essential to the success of our conference.

Altogether, 34 papers were selected for publication in this Conference Proceedings volume. Each submission was evaluated by one Program Committee member and two independent reviewers. We would like to thank the members

of the Program Committee for the evaluation of the submissions and the numerous referees who assisted in this work. We also thank the members of the Organizing Committee, and all the people, unheard and untold, that made the 8-th edition of the Joint Conference in Mathematics and Computer Science an enjoyable and productive reality.

July 2011

Horia F. Pop

Department of Computer Science
Babeş-Bolyai University
Cluj
Romania

Antal Bege

Department of
Mathematics and Informatics
Tg. Mureş/Marosvásárhely
Sapientia Hungarian University
of Transylvania
Cluj-Tg. Mureş-M. Ciuc
Romania

Editorial Board

- Bege, Antal (Sapientia University, Târgu-Mureş)
- Boian, Florian Mircea (Babeş-Bolyai University, Cluj-Napoca)
- Bukor, József (János Selye University, Komárno)
- Csörnyei, Zoltán (Eötvös Loránd University, Budapest)
- Horváth, Sándor (Eötvös Loránd University, Budapest)
- Kása, Zoltán (Sapientia University, Târgu-Mureş)
- Pop, Horia Florin (Babeş-Bolyai University, Cluj-Napoca)
- Stoffová, Veronika (János Selye University, Komárno)

Co-Chairs of the 8th MaCS Conference

- Mocanu, Petru (Babeş-Bolyai University, Cluj-Napoca)
- Sebestyén, Zoltán (Eötvös Loránd University, Budapest)

Steering Committee

- Bege, Antal (Sapientia University, Târgu-Mureş)
- Csörnyei, Zoltán (Eötvös Loránd University, Budapest)
- Faragó, István (Eötvös Loránd University, Budapest)
- Páles, Zsolt (University of Debrecen)
- Pop, Horia Florin (Babeş-Bolyai University, Cluj-Napoca)
- Soós, Anna (Babeş-Bolyai University, Cluj-Napoca)
- Tóth, László (University of Pécs)

Scientific Committee

- Andrica, Dorin (Babeş-Bolyai University, Cluj-Napoca)
- Boian, Florian Mircea (Babeş-Bolyai University, Cluj-Napoca)
- Breckner, Wolfgang (Babeş-Bolyai University, Cluj-Napoca)
- Bucholich, Zoltán (Eötvös Loránd University, Budapest)
- Bukor, József (János Selye University, Komárno)
- Coman, Gheorghe (Babeş-Bolyai University, Cluj-Napoca)
- Csörnyei, Zoltán (Eötvös Loránd University, Budapest)
- Daróczy, Zoltán (University of Debrecen)
- Faragó, István (Eötvös Loránd University, Budapest)
- Hatvani, László (University of Szeged)
- Horváth, Sándor (Eötvös Loránd University, Budapest)
- Horváth, Zoltán (Eötvös Loránd University, Budapest)
- Kása, Zoltán (Sapientia University, Târgu-Mureş)
- Kolumbán, József (Babeş-Bolyai University, Cluj-Napoca)
- Kozma, László (Eötvös Loránd University, Budapest)
- Krisztin, Tibor (University of Szeged)
- Petruşel, Adrian (Babeş-Bolyai University, Cluj-Napoca)
- Pop, Horia Florin (Babeş-Bolyai University, Cluj-Napoca)
- Precup, Radu (Babeş-Bolyai University, Cluj-Napoca)
- Rus, A. Ioan (Babeş-Bolyai University, Cluj-Napoca)
- Stoffová, Veronika (János Selye University, Komárno)
- Schipp, Ferenc (Eötvös Loránd University, Budapest and University of Pécs)
- Simon, Péter (Eötvös Loránd University, Budapest)
- Simon, László (Eötvös Loránd University, Budapest)
- Stoyan, Gisbert (Eötvös Loránd University, Budapest)
- Tâmbulea, Leon (Babeş-Bolyai University, Cluj-Napoca)

Organizing Committee

- Bege, Antal (Sapientia University, Târgu-Mureş)
- Bukor, József (János Selye University, Komárno)
- Csendes, Tibor (University of Szeged)
- Csiba, Peter (János Selye University, Komárno)
- Csízi, Ladislav (János Selye University, Komárno)
- Csörnyei, Zoltán (Eötvös Loránd University, Budapest)
- Filip, Ferdinand (János Selye University, Komárno)
- Gubo, Štefan (János Selye University, Komárno)
- Horváth, Sándor (Eötvös Loránd University, Budapest)
- Kassay, Gábor (Babeş-Bolyai University, Cluj-Napoca)
- Nagy, Zoltán (János Selye University, Komárno)
- Páles, Zsolt (University of Debrecen)
- Pártová, Edita (János Selye University, Komárno)
- Robu, Judit (Babeş-Bolyai University, Cluj-Napoca)
- Soós, Anna (Babeş-Bolyai University, Cluj-Napoca)
- Stoffová, Veronika (János Selye University, Komárno)
- Szókö, Štefan (János Selye University, Komárno)
- Tóth, Krisztina (János Selye University, Komárno)
- Tóth, László (University of Pécs)
- Végh, Ladislav (János Selye University, Komárno)

List of Reviewers

- Baricz, Árpád (Babeş-Bolyai University, Cluj-Napoca)
- Boian, Rareş (Babeş-Bolyai University, Cluj-Napoca)
- Bufnea, Darius (Babeş-Bolyai University, Cluj-Napoca)
- Crivei, Septimiu (Babeş-Bolyai University, Cluj-Napoca)
- Csato, Lehel (Babeş-Bolyai University, Cluj-Napoca)
- Csörnyei, Zoltán (Eötvös Loránd University, Budapest)
- Czibula, Gabriela (Babeş-Bolyai University, Cluj-Napoca)
- Dévai, Gergő (Eötvös Loránd University, Budapest)
- Dioşan, Laura (Babeş-Bolyai University, Cluj-Napoca)
- Diviánszky, Péter (Eötvös Loránd University, Budapest)
- Fekete, István (Eötvös Loránd University, Budapest)
- Frenţiu, Militon (Babeş-Bolyai University, Cluj-Napoca)
- Fülöp, Ágnes (Eötvös Loránd University, Budapest)
- Gonda, János (Eötvös Loránd University, Budapest)
- Hoch, Csaba (Eötvös Loránd University, Budapest)
- Horváth, Sándor (Eötvös Loránd University, Budapest)
- Istenes, Zoltán (Eötvös Loránd University, Budapest)
- Kása, Zoltán (Sapientia University, Târgu-Mureş)
- Kitlei, Robert (Eötvös Loránd University, Budapest)
- Kovács, Lehel (Sapientia University, Târgu-Mureş)
- Kozsik, Tamás (Eötvös Loránd University, Budapest)
- Kupán, Pál (Sapientia University, Târgu-Mureş)
- Lazăr, Ioan (Babeş-Bolyai University, Cluj-Napoca)
- Lőrincz, András (Eötvös Loránd University, Budapest)
- Motogna, Simona (Babeş-Bolyai University, Cluj-Napoca)
- Niculescu, Virginia (Babeş-Bolyai University, Cluj-Napoca)
- Oltean, Mihai (Babeş-Bolyai University, Cluj-Napoca)
- Papp, Gáborné (Eötvös Loránd University, Budapest)
- Pásztor Varga, Katalin (Eötvös Loránd University, Budapest)
- Petruşel, Adrian (Babeş-Bolyai University, Cluj-Napoca)
- Porkoláb, Zoltán (Eötvös Loránd University, Budapest)
- Săcărea, Christian (Babeş-Bolyai University, Cluj-Napoca)
- Szász, Róbert (Sapientia University, Târgu-Mureş)
- Tejfel, Máté (Eötvös Loránd University, Budapest)
- Vancea, Alexandru (Babeş-Bolyai University, Cluj-Napoca)

CONTENTS

MATHEMATICS

| | |
|---|----|
| D. ANDRICA, R.-A. ROHAN, <i>The image of the exponential map and some applications</i> | 3 |
| Zs. BARTHA, A. BEGE, <i>Hyperperfect numbers and generalizations</i> | 15 |
| A. IVÁNYI, Zs. NÉMETH, <i>List coloring of Latin and Sudoku graphs</i> | 23 |
| B. KIRÁLY, <i>Generalized Walsh-like systems</i> | 35 |
| L. LÓCSI, <i>Constructing orthogonal systems using Blaschke products</i> | 43 |
| R. PRECUP, M.-A. ȘERBAN, D. TRIF, <i>Asymptotic stability for cell dynamics after bone marrow transplantation</i> | 51 |
| R. SZÁSZ, <i>On Starlikeness of Bessel functions of the first kind</i> | 63 |
| P. VARGA, <i>Characterization of semi-CNS polynomials</i> | 71 |
| K. PÁSZTOR VARGA, M. VÁRTERÉSZ, <i>Many-valued logics – theorem proving problems</i> | 91 |
| J. ZICHOVÁ, <i>An application of time series analysis in finance</i> | 99 |

COMPUTER SCIENCE

| | |
|--|-----|
| F.M. BOIAN, <i>Web services: definitions, models, teaching aspects</i> | 109 |
| Á. AGÓCS, Á. FÜLÖP, <i>Jet reconstruction of individual orbits in many-particle problems</i> | 123 |
| G. ALAGI, <i>A type system for parallel resource sharing</i> | 139 |
| T. ÁSVÁNYI, <i>DCGs for parsing and error handling</i> | 153 |
| M. BICZÓ, <i>A state space reduction unit testing framework based on generated proxy objects</i> | 163 |
| Zs. BORSI, L. KOZMA, <i>Verification of component-based system using model checking</i> | 175 |

| | |
|--|-----|
| R.D. GĂCEANU, H.F. POP, <i>An adaptive fuzzy agent clustering algorithm for search engines</i> | 185 |
| A. GÓBI, T. KOZSIK, <i>Type inference in $G\flat$</i> | 197 |
| ZS. HERNÁTH, P. BAUER, B. KÓSZEGI, G. TAKÁCS, <i>Design and implementation of a macro language transforming ODF schemata</i> | 211 |
| Z. ISTENES, N. GASKÓ, D. DUMITRESCU, <i>Robotics from a game theoretical approach</i> | 227 |
| H. JAKAB, B. BÓCSI, L. CSATÓ, <i>Non-parametric value function approximation in robotics</i> | 235 |
| A. JÁRAI, E. VATAI, <i>Cache optimized sieve</i> | 249 |
| Z. KÁSA, <i>Super-d-complexity of finite words</i> | 257 |
| R. KIRÁLY, R. KITLEI, <i>Application of complexity metrics in functional languages</i> | 267 |
| G. KISS, <i>Measuring students' Computer Science knowledge in the first two years of secondary grammar school in Hungary</i> | 283 |
| T. KMET, <i>Neural network simulation of feeding adaptations of filter feeders: Daphnia</i> | 297 |
| Z. KOVÁCS, A. PÉNZES, <i>A Haskell implementation of an attack on Dömösi's cryptosystem</i> | 311 |
| A. MEDVE, L. KOSZMA, <i>MDE process and model improvement using the Verimag IFx verification tools</i> | 323 |
| M. MÉSZÁROS, Z. HORVÁTH, A. KOVÁCS, D. LESKÓ, <i>Layered representation of source code</i> | 337 |
| M. MURÍN, M. ULBRICHT, <i>Mathematical model of multicriteria scheduling in grid environment and its improvements</i> | 351 |
| N. PATAKI, <i>C++ Standard Template Library by safe functors</i> | 363 |
| Á. SINKOVICS, <i>Unit testing of C++ template metaprograms</i> | 375 |
| V. SLODIČÁK, CS. SZABÓ, <i>Recursive coalgebras in mathematical theory of programming</i> | 385 |

| | |
|--|-----|
| Cs. SZABÓ, B. SOBOTA, R. KIŠ, <i>Terrain LoD in real-time 3D map visualization</i> | 395 |
| M. TÓTH, I. BOZÓ, Z. HORVÁTH, M. TEJFEL, <i>First order flow analysis for Erlang</i> | 403 |